PORTABLE SPECTROMETER FOR THE PRESUMPTIVE IDENTIFICATION OF ILLICIT DRUGS AND SUBSTANCES OF ABUSE

CROSS-REFERENCE TO RELATED APPLICATIONS/INCORPORATION BY REFERENCE STATEMENT

This application is a national stage application filed under 35 USC 371 of PCT/US2014/037483, filed May 9, 2014; which claims benefit under 35 U.S.C. 119(e) of U.S. Provisional Patent Application Ser. No. 61/821,472, filed May 9, 2013, the entire contents of each of which are hereby expressly incorporated herein by reference.

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

A portion of this work was sponsored by National Institute of Justice Award Number 2012-R2-CX-K005. The U.S. Government therefore has certain rights in the invention.

BACKGROUND

The problem faced by the drug analysts in the forensics community is the difficulty in identifying certain types of controlled substances. The frequency of new drugs introduced in the party environment is at an alarming rate and this enhances the problem faced by the drug analysts. One such drug hard to identify is benzylpiperazine (BZP), commonly known as Legal X. Currently, there are no presumptive tests available for BZP. Additionally, phenylcyclidine (PCP) and cocaine cannot be distinguished from each other using the conventional presumptive methods. Problems like these can lead to false positives or negatives for a certain drug because of the indistinguishable presumptive results.

There are many reagent kits that exist which are used to presumptively identify the drugs based on the color they yield. Different tests are used to identify certain drugs. For example, Marquis' reagent, a solution of formaldehyde and sulfuric acid, is used to identify MDMA (ecstasy) and some other opiates while a cobalt thiocyanate test is used to detect the presence of cocaine. These reagents are added to an unknown drug and react with it to result in a change of color. The resulting color will correspond to a specific drug. The problem that presents itself is that the results depend on the perception of color by the officers or agents using the kits and their ability to compare the result to those in a given list of drugs and their resultant color. In addition, some of the results give a range of colors (i.e. "strong reddish orange to deep reddish brown" or "olive green to yellow"), which make it even more difficult for a consensus presumption of the identity of the drug. In short, this method has a relatively high rate of false positives and false negatives. In the case of the cobalt thiocyanate test, diphenhydramine (e.g., Benadryl®, available from McNeil Consumer Healthcare, Fort Washington, Pa.) yields results similar to cocaine. Confirmatory testing of these unknown substances can be done by methods such as TLC and GC-MS. However, these methods are time consuming as most of the GC-MS samples are done in situ. Portable GC-MS devices do exist, but the major drawback is that they need properly trained officers or agents to use them and the equipment is expensive.

The idea of an easy-to-use, low cost and portable device to identify unknown drugs is very attractive in the forensics community. Thus, there is a need for a low cost and portable device that can presumptively identify illicit drugs and common substances of abuse. It is to such a low cost and portable device that the present disclosure is directed.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

The accompanying drawings, which are incorporated in and constitute a part of this specification, illustrate one or more implementations described herein and, together with the description, explain these implementations. In the drawings:

FIG. **1** is a schematic diagram of hardware forming an exemplary embodiment of a portable spectrometer system constructed in accordance with the present invention for analyzing an emission to determine an identity of an unknown substance.

FIG. **2** is a pictorial representation of a mobile computing device, for example, a cellular telephone, and a fluorimeter of the portable spectrometer system generating and collecting an emission spectrum of a test strip with an unknown substance in accordance with the present invention.

FIG. **3** is a photograph of emissions caused by different substances with a luminescent cluster compound being stimulated by UV radiation in accordance with the presently disclosed inventive concepts.

FIG. **4** is a pictorial representation of a part of a fluorimeter constructed in accordance with the presently disclosed inventive concepts.

FIG. **5** is a diagrammatic representation of a path through which an emission is separated into its emission spectra and guided to an optical sensor in accordance with the presently disclosed inventive concepts.

FIG. **6** is a diagrammatic representation of a partially exploded view of the components forming the fluorimeter in accordance with the presently disclosed inventive concepts.

FIG. **7** is an exemplary graph of comparisons of resulting spectra of exemplary compounds in accordance with the present disclosure.

FIG. **8** is an exemplary graph of sample data from codeine (an opiate) on a test strip in accordance with the present disclosure.

FIG. **9** is an exemplary graph of sample data from dextromethorphan (an alkaloid) on a test strip in accordance with the present disclosure.

DETAILED DESCRIPTION OF THE PRESENTLY DISCLOSED AND CLAIMED INVENTION

Before explaining at least one embodiment of the invention in detail, it is to be understood that the invention is not limited in its application to the details of construction, experiments, exemplary data, and/or the arrangement of the components set forth in the following description or illustrated in the drawings.

As used herein, the terms "comprises," "comprising," "includes," "including," "has," "having" or any other variation thereof, are intended to cover a non-exclusive inclusion. For example, a process, method, article, or apparatus that comprises a list of elements is not necessarily limited to only those elements but may include other elements not expressly listed or inherent to such process, method, article, or apparatus. Further, unless expressly stated to the contrary, "or" refers to an inclusive or and not to an exclusive or. For example, a condition A or B is satisfied by anyone of the following: A is true (or present) and B is false (or not